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ABSTRACT

A study investigated a model that takes into account the influence of conceptual, cultural, and linguistic variables in formation of verbal and nonverbal concepts in bilingual children. This triple-interaction model states that concepts are represented in three ways: (1) nonverbally as abstract categories; (2) symbolically by means of sociocultural conventions; and (3) linguistically by structures and markers. Subjects, 30 Spanish/English bilingual children aged 6-7 years who were attending kindergarten and first grade classrooms in central Texas, performed five verbal and nonverbal classification tasks to measure the three ways of representing concepts. Three verbal classification tasks included labeling, defining, and verbal justification for sorting. Two nonverbal tasks were sorting and category clues. The tasks were administered in both English and Spanish. Each task was scored twice to give credit for both general categorization criteria and gender classification or assignment. It was hypothesized that in a bilingual child the abstract categories constituting nonverbal representations were common to both languages or unique to each, depending on the commonness or uniqueness of the representations of symbolic meanings of linguistic conventions made by the sociocultural community. Results indicate the children constructed one representational system common to English and Spanish and another, unique to Spanish, for certain object categories. Nonverbal classification was performed better than verbal classification in both languages. (MSE)

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A Model of Cognitive, Cultural and Linguistic Variables Affecting Bilingual Spanish/English Children's Development of Concepts and Language

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Summary

Objectives

The theoretical purpose of this research study was to explain the process of the formation of verbal and non-verbal concepts in bilingual children through the creation of a new model that takes into account the influence of conceptual, cultural, and linguistic variables. The applied purpose of this research study was the empirical validation of the model for the assessment of first and second language development, and verbal and non-verbal conceptual development.

Perspectives and Theoretical Framework

The preliminary triple-interactional model proposed states that concepts are represented in three ways: (a) non-verbally as abstract categories, (b) symbolically by meanings of sociocultural conventions, and (c) linguistically by structures and markers. Bilingual subjects were selected to test empirically the model because they are natural laboratories for the interaction between cognitive, cultural, and linguistic variables. It was hypothesized that in a bilingual child the abstract categories that constitute non-verbal representations were common to both languages, or unique to each language, depending on the commonness or uniqueness of the representations of symbolic meanings of linguistic conventions made by the sociocultural community. The characteristics of abstract categories depend on conceptual (i. e. , basic and non-basic semantic categories), linguistic (i. e. , familiar and unfamiliar words, and similar and different linguistic structures and markers for gender), and cultural variables (i. e. , animate object referents as animals, and inanimate object referents as food, natural gender and arbitrary linguistic gender respectively). Gender was selected as the linguistic structure to study, because the Romance languages have many markers at the lexical level for gender where English has few or none.

Different traditional models and more recent approaches to the study of representation of knowledge lead to the consideration of the relationship between cognition and language, and the formation of semantic categories based on the interaction of cognitive, cultural, and linguistic variables. A traditional approach to the study of the representation of knowledge is the

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theory of semantics (Lambert, Havelka, & Crosby, 1958) with two traditional hypotheses: (a) the concept mediation hypothesis, with one representational for concepts in both languages; and (b) the word mediation hypothesis, with two representational systems for words in both languages. Genesee (1989) proposed that children develop different language systems and are able to use them in ways sensitive to sociocultural contexts.

The debate on the relationship between cognition and language in modern terms can be dated to the mid 1950s. The positions can be roughly characterized as: (a) cognition is dependent upon language (Sapir-Whorf hypothesis, 1956); and (b) language and cognition are independent of one another in both source and development (Chomsky, 1957); (c) language development is dependent upon prior cognitive development (in both a "strong" -Sinclair de Zwart, 1969- and a "weak" form -Cromer, 1974-); (d) language and cognition share a common source and develop along parallel lines (bates & MacWhinney, 1981); and (e) language and cognitive development interact with each other (Schlesinger, 1977; & Bowerman, 1976).

Two parallel theoretical approaches have been constructed for the explanation of the formation of semantic categories. The first is the traditional model that has three hypotheses: (a) the strong cognition hypothesis (Anglin, 1975; Bruner & Olver, 1963; Brown, 1958, 1965; Flavell, 1970, 1978; Inhelder & Piaget, 1964; Piaget, 1964, 1965, 1967; Rescorla, 1980; Vygotsky, 1964) that states a progression from specific to general dimensions, that is the child classifies objects in terms of complex groupings in contrast to adults who classify taxonomically; (b) the weak cognition hypothesis with the influence of sociocultural factors: perceptual attributes versus function (Clark, 1973; Nelson, 1974, 1983, 1987, 1988) that states that the child invents his or her own categories, and that concepts whether nonlinguistic or semantic in nature are defined by attributes held in common by all instances; and (c) the weak cognition hypothesis with the influence of linguistic factors (Bowerman, 1976, 1977, 1985, 1988) that states that the interaction between the semantic structure of the linguistic input and children's nonlinguistic predispositions for categorizing contribute to the language learner's organization of meaning.

The second theoretical approach constructed for the explanation of the formation of semantic categories is the triple interactional model with three submodels: (a) characteristic-attribute models (Ijaz, 1978; Rosch, Mervis, Gray, Johnson, & Bayes- Braem, 1976; Rosch & Mervis, 1975) that states that in the real-world, attributes have a correlational structure, so that humans categorize concrete objects in hierarchical taxonomies (a system by which categories are related to one another by means of class inclusion) that have different levels of abstraction (superordinate, basic, and subordinate levels); (b) constraint model (Gelman & Taylor, 1984; Markman, 1981; Markman &

Hutchinson, 1984; Shipley, 1989; Waxman, 1989, 1990; Waxman & Gelman, 1986; Waxman & Kosowski, 1989) that expanded the characteristic-attribute model top different variations of the linguistic stimuli presented at basic and non-basic level categories: novel count and mass nouns, novel object nouns; and (c) sociocultural/content knowledge model (Anderson, 1985; Matsuyama, 1983; Miller & Stigler, 1987; Palermo, 1983).

From the previous two general models presented, it can be concluded that there has been a historical theoretical evolution around the methodological problems associated with the classification task. In general, classification has been studied from two approaches: (a) traditional, based on production tasks, with ambiguous open-ended verbal instructions, and concrete objects that could be categorized at a superordinate level; and (b) characteristic-attribute model and constraint approach based on production, with specific verbal clues (English verbal labels, and novel lables, Japanese and nonsense syllables), using natural language for the verbal instructions, and using concrete or pictorial objects that could be categorized at different hierarchical levels (superordinate, basic level, intermediate, and subordinate). Due to the different verbal instructions and clues, and different stimuli used by these two approaches, the results have been different and contradictory. At present, the different theoretical models are converging into a single interactional model, where cognitive, sociocultural, and linguistic factors interact in the mapping process of non-verbal concepts onto semantic categories.

Method

Subjects

Subjects for this study were 30 bilingual children, 6-7 years-olds, who were attending kindergarten and first grade classrooms in central Texas.

Instruments

Five verbal and non-verbal classification tasks were created for measuring the three ways of representing concepts, such as non-verbal, symbolic, and linguistic instantiations. One way of showing the interaction of these three ways of representing concepts is by assessing children's sensitivity to conventional linguistic gender markers in their language. The three verbal classification tasks were labelling, defining, and verbal justification for sorting. The two non-verbal classification tasks were sorting and category clue. The children worked with manipulable objects that represented animate (animals) and inanimate items (food), that corresponded to 14 experimental stimuli groupings representing the cognitive, cultural, and linguistic variables in order to test particular cases of

the conceptual groupings for linguistic gender assignment in Spanish and English. The Test of Nonverbal Intelligence (TONI, Brown, Sherbenou, & Dollard, 1982), the IDEA Oral Language Proficiency test in English (Ballard, Tighe, & Dalton, 1979), and the Bilingual Families Home Survey were recorded from the children's school files.

Procedure

The administration of the five verbal and non-verbal classification tasks was given once in English and again in Spanish in counterbalanced order by a fully bilingual examiner. The interval between first and second language sessions was no more than one week. In all five classification tasks, stimuli were presented top the child in a consistent sequential order previously set for all subjects on a random basis. Two parallel sets of stimuli were used in order to avoid practice and transfer of learning effect. The two language sessions were videotaped. The creation of the experimental stimuli was done with the help of bilingual teachers and linguists, who participated as judges for assessing reliability. After the categorization and selection of stimuli was finished, three pilot tests were conducted with ten children from the same population of the final sample for this research study. Teachers' Ratings were also collected as informal measures of Spanish and English language proficiency, which were used as predictors for the verbal and non-verbal classification tasks.

Scoring for Classification Tasks

The five tasks were scored twice, first for giving credit for general criteria for categorization (e. g. , color, functions, subcategories) and second by giving credit for correct gender classification (e. g. , physical gender: these are boy dinosaurs, linguistic gender assignment: there are cows, or functional use related to gender: this small watermelon is for my mom, and this large watermelon is for my dad).

Results and Conclusions

Pearson chi-square tests of association, and stepwise multiple linear regression were used for data analysis. The most important finding was the empirical validation of the model. The results showed that bilingual children constructed: (a) one representational system common to Spanish and English for knowledge of linguistic structures and non-verbal abstract and symbolic categories, related to general criteria for categorization for animals object referents; and (b) a second representational system, unique to Spanish, for the symbolic meaning of the linguistic structures related to gender-based

categories for food object referents. In addition, children performed higher for non-verbal than for verbal classification tasks in both languages, and in both cases at or above their chronological age and developmental level in relation to Piagetian stages. The referent category also made a difference with children performing between on the verbal tasks for inanimate referents than for animate referents in both languages. All informal and standardized assessments of the children's language levels and non-verbal intelligence moderately predicted performance on the verbal and non-verbal classification tasks. However, most children were diagnosed as below normal non-verbal intelligence level with the TONI and at or above normal level with the verbal and non-verbal classification tasks

Scientific and Educational Importance of the Study

The empirical validation of this new triple-interactional model suggests that a second research study is needed in order to test the theory with a broader sample of subjects. Thus, the model can be useful as a basis for the development of a qualitative method for assessing verbal and non-verbal conceptual development in bilingual children. The future practical implications of this research study point to the fact that current methods of assessment of bilingual children used by the school system, are not discriminating accurately between true disabilities and the normal process of verbal and non-verbal conceptual development as they are giving different diagnosis of the cognitive-linguistic abilities of bilingual children in comparison with informal and qualitative methods. Bilingual children performed in the classification tasks at normal verbal developmental levels, and at above normal non-verbal conceptual developmental levels; in relation to their chronological and developmental age. In contrast, most children were diagnosed as having below normal intelligence levels, and below normal language proficiency levels in both Spanish and English. Bilingual children could be accurately diagnosed with these verbal and non-verbal classification tasks in the ares of language and verbal and non-verbal conceptual development after a second study of theory testing is conducted with a broader sample. Thus, a differential diagnosis between true disabilities and the normal process of language development in Spanish and English, and verbal and non-verbal conceptual development could be possible for language minority children.